TECHNICAL SPECIFCATION FOR FRP WALL SUPPORTING EXTENDABLE LADDER

1.0 SCOPE:

This specification cover the requirement for the complete design, Manufacture, fabrication, testing and inspection at manufacture's work ,Packing, supply of insulating type extendable FRP with epoxy resin Ladder for safety with Hardware, accessories, fittings etc.

2.0 **FRP (FIBERGLASS REINFORCED PLASTIC) LADDERS** are versatile and safe for various applications, including domestic, industrial, and electrical work. Key specifications include their lightweight and high strength, resistance to corrosion and electrical conductivity, and often a slip-resistant design. They are available in various lengths, from step ladders to extension ladders, and may feature features like a platform for comfortable work.

3. CLIMATIC CONDITIONS:

The equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical condition

1 Maximum ambient temperature (deg. C)	50
2 Minimum ambient temperature (deg. C)	5.
3 Relative humidity (%)	10 to 100
4 Maximum rainfall (mm)	1450
5 Maximum wind pressure (kg/sq. m)	150
6 Maximum altitude above mean sea level (METER)	1000
7 Isoceraunic level (day/year)	50
8 Seismic level (Horizontal acceleration) (G)	0.25g
9 Climate moderately hot and humid tropical climate, conducive to rust and fungus growth	

3.0 STANDARDS:

All components used in the manufacture of the FRP Ladder shall conform to the relevant International or Indian standard.

4.0 MATERIAL AND CONSTRUCTION:

- **Fiberglass Reinforced Plastic:** The primary material is FRP, making the ladder lightweight and durable.
- **Stiles:** FRP stiles (side rails) provide strength and non-conductive properties, making them safe for use near electricity.
- **Rungs/Steps:** Rungs or steps are often made of fiberglass, with options for antiskid designs.

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- **Joints:** Rung joints are designed to prevent twisting and ensure a stable connection.
- **Footwear:** Slip-resistant feet/ anti slip properties and ground contact.
- **Platform:** FRP ladders include a platform for comfortable work at height.
- **Lightweight:** FRP ladders are significantly lighter than metal ladders, making them easier to transport and maneuver.
- **Width:** The outside width of a manhole ladder is typically around 12-14 inches.
- **Rung Spacing:** Rung spacing is often 300mm.

4. SAFETY FEATURES:

- **Non-Conductive:** FRP ladders shall insulate against heat & Electricity, non-conductive, shall be safe for use around high voltage environments (Tested to withstand upto 250kV/Mtr power frequency test voltage.)
- **Slip-Resistant:** Slip-resistant rungs and steps provide secure footing.
- **EN131 Certification:** FRP ladders are EN131 certified, meeting European safety standards, as in Y-Access FRP (Fiberglass) Single Sided Self Supporting Ladder. (If applicable)
- **Load Capacity:** FRP ladders have a specified load capacity, typically 150kg,
- **Fire redundant:** The FRP ladder material shall resist to catching fire immediately/ ladder shall be Flame redundant.

5.0 GENERAL TECHNICAL REQUIREMENTS:

FRP Wall Supporting Extendable Ladder

Sl No	Particulars	Details
1	Side	The ladder side rail shall be rectangular type with a wall thickness of 60 x 30 x 4mm. The rungs shall be pultruded structural shapes, continuously fluted to provide a non-slip surface. Rungs that are gritted as a secondary operation shall not be permitted.
2	Steps	FRP fluted Rungs with outer dia of 32 mm steps (All rungs shall be both mechanically attached to the ladder with FRP dowels and chemically bonded with Methyl Methacrylate or Poly Urethane Adhesive. Riveted connections shall not be permitted) and shall have anti slip properties, Step ring spacing shall be 12 inches (300mm)
3	Closed Height	10 Ft
4	Extended Height	18 Ft
5	Lock	Heavy duty lock with pulley and poly propylene rope for extension
6	Bottom & Top	Fitted with non-slippery rubber pad on the lower and upper side min 50 mm wide.
7	Duty Rating	150 Kgs - (Extra heavy duty)
8	Type	Type-1, Heavy Duty Industrial Ladder

Sl No	Particulars	Details
9	Weight	Approx. 2.2kg/mtr
10	Color	All ladder components are to be integrally pigmented yellow.
11	Logo Marking	Every 5ft, BESCOM Logo should be printed on either railings
12	Additional Information	All finished surfaces of FRP items and fabrications shall be smooth, resin rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering. IS/EN/ANSI Standard Compliance

5.1 The Ladder shall be antistatic, non-absorbent, waterproof and ultra violet resistant, anti-slippery S3 grade as per IS 13410 and IS 3696-2:1991

5.2 FRP Ladder shall be made utilizing FRP pultruded sections /pickets. FRP sections shall be made from an advanced formulation of thermosetting polyester Resin with Glass Fiber Reinforcement on state of art electronically controlled pultrusion technology. Manufacturing process shall be pultrusion using automated pultrusion machines.

5.3 Height limit Indicator: Red ring to indicate Max –safe standing height.

5.4 Telescopic model collapse to a compact size for easy storage & transport, folding or push up mechanisms for extension ladders

5.5 Ladder shall be made up of FRP with epoxy resin and FRP material shall be corrosion resistant, fire retardant resistant to chemiclas acids, alkalis & organic solvents.

5.6 The oxygen index shall be minimum 24% as per IS 13410.

5.7 The minimum glass content in the FRP shall be min 45%.

5.8 The FRP Ladder shall be free from sharp edges and corners, burns and Unevenness.

5.9 The FRP Ladder shall be supplied in completely knocked down condition and shall be of ready to use type.

5.10 FRP pultruded section / pickets shall have following mechanical Properties

Sl. No.	Parameter	Value for pultruded section
1.	Ultimate tensile Strength (IS:14887)	2000-4000 kg/cm2
2.	Flexural Strength	2000-10000 Kg/ cm2
3.	Flexural Modulus	1.5-5x100000Kg/cm2
4.	Izod impact:	20Kg/cm/cm
5.	Compressive Strength	1500-5000 Kg/cm2
6.	f) Compressive Modulus	2.5-4.5 Kg/ cm2
7.	Bar col thickness	50-65Gpa

8.	Water absorption	<=0.6
9.	Load Deflection	As per IS:4571:1977 CL.No.6.1
10.	Strength Of Round	As per IS:4571:1977 CL.No.6.2
11.	Dimension	18 Ft

5.11 FRP pultruded sections/ pickets shall have following electrical properties

Parameter	Value for pultruded section
Di electrical strength axial	30-45 KV/25mm
Di electrical strength radial	10-15 KV/25mm

5.12 FRP pultruded section shall be type tested for following.

a) Specific optical density of smoke according to BS-476, part5
b) Fire propagation according to BS-476, part 6. The flame spread index shall not be more than 15.
c) Surface spread of flame according to BS-476 part 7 (class-1 fire rating)

6.0 TESTS:

The FRP Pultruded sections used in FRP Ladder shall be fully type tested for Mechanical Properties, Electrical Properties, Fire Propagation, low flammability Fire Rating & Specific Optical Density as stated above.
All the Type Tests shall be carried out from Laboratories such as CPRI, ERDA, CIPET to prove that the FRP pultruded section meets the requirements of specification.

7.0 TESTING AND MANUFACTURING FACILITIES:

7.1 The bidder shall have necessary machinery for production of FRP pultruded Section using automated pultrusion machines used for FRP Ladder.
7.2 Manufacturer should have in house testing facilities for carrying out the following

8.0 ROUTINE TEST

Sl. no	Description	Requirement
1	Dimension	As per approved drawing
2	Visual appearance	Smooth and free from any defect
3	Glass content	FRP minimum 45%
4	Dry Electric Test	250kV/mtr power frequency test voltage

9.0 TYPE TEST CERTIFICATES

The bidder shall submit type test reports as per clause 5.10, 5.11 & 5.12 tested from CPRI, ERDA, CIPET or any govt laboratories along with the offer. Type Test Certificate Should not be older than 5 years as on the date of tender opening.

Certificates: Complies with EN 131 and shall meet OSHA/ANSI standards for safety.

10 ACCEPTANCE TEST.

10.1 Inspection of each lot. Sampling plan for test 3 Nos. which are selected randomly from Lot for testing works.

Sl.No.	Test Requirement	Reference standards
1	Marking	
2	Dimensions and construction	
3	Water Absorption	IS:13410
4	Melting Point (To test up to 400deg c.)	IS:13360
5	Glass content	IS:13411
6	Dielectric test	250kV/mtr Power frequency test voltage

11.0 DISPATCH

The material to be supplied shall be packed and dispatched only after inspection and approval.

General Manager (El.,)
Q,S&S, BESCOM

Typical drawing only for reference